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| Thomas R. FitzGerald, Esq. Suite 210 16 E. Main Street Rochester, NY 14614-1803 | | | ART UNIT 2851 | PAPER NUMBER |

DATE MAILED: 03/17/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/734,462

Applicant(s)

SMITH, BRUCE W.

Examiner

Kevin Gutierrez

Art Unit

2851

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 09 January 2006.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-39 is/are pending in the application.
- 4a) Of the above claim(s) 23-39 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-22 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☐ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____.
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____.

DETAILED ACTION

Response to Arguments

1. Applicant's arguments filed January 9, 2006 have been fully considered but they are not persuasive.

Regarding the arguments on page 7, fourth paragraph, the Applicant states "the invention is not shown because the claims provide that the image of the target is resolved on the photoresist." This limitation is not set forth in the claims. However, Chen discloses a target utilized to print an image for resolving aberrations.

Regarding the arguments on page 7, fifth paragraph, the Applicant states "Chen intentionally uses features that cannot be resolved by the optical system." However, Paragraph [0072] of Chen discloses that the OHR monitor can be utilized to detect aberrations. Refer to Paragraph [0073], the resist patterns and OHR monitor are resolved by the position of the inner and outer ring 14, 15. Therefore, the features are resolvable.

Regarding the arguments on page 7, sixth paragraph and page 8, second paragraph, the applicant argues that the references alone or in combination do not make up for the deficiencies of the Chen reference, the fact that applicant has recognized another advantage which would flow naturally from following the suggestion of the prior art cannot be the basis for patentability when the differences would otherwise be obvious. See *Ex parte Obiaya*, 227 USPQ 58, 60 (Bd. Pat. App. & Inter. 1985).

For the reasons stated above, the rejection(s) of the claims have been maintained.

Claim Objections

2. Claim 1 is objected to because the amended limitation is not supported by the specification.

3. Claim 15 is objected to because of the following informalities:

a. Page 22, line 28 - “...aberation” where the underlined text appears to have a spelling error. The Applicant has amended the claims in light of the misspelling, but has not amended claim 15 as previously indicated.

Appropriate correction is required.

Claim Rejections - 35 USC § 102

4. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless -

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

5. Claims 1, 2, 6-10 and 13-21 are rejected under 35 U.S.C. 102(e) as being anticipated by Chen (US 2003/0098970).

Regarding claim 1, Chen discloses

- “providing a test target (10; OHR monitor) with at least one open figure including a multiple component array of phase zones (12),
 - wherein the multiple phase zones resolvable by the optical system [0072-0073] are arranged within the open figure so that their responses to lens aberrations are interrelated and the phase zones respond uniquely to specific aberrations depending on their location within the figure (see fig.5b, where 12 and 14 are sub-resolution features and [0058], lines 4-5);
 - placing the test target in an object plane of a projection system ([0003], lines 1-2);
 - imaging a photoresist film with the projection system ([0003], lines 2-4); and
 - comparing the image in the photoresist film to a reference image without aberrations to detect aberrations in the optical system ([0019], lines 10-13, where predetermined patterns are printed on a substrate and then compared to the predetermined patterns of the mask).”

Regarding claim 2, Chen discloses “wherein the differences between the imaged photoresist and the reference image indicate the type and degree of aberration ([0063], lines 16-18).”

Regarding claim 6, Chen discloses “wherein the phase zones are 180 degrees out of phase with respect to the rest of the target ([0060], lines 3-4).”

Regarding claim 7, Chen discloses “wherein the phase zones are etched into the surface of the target (Fig. 6, 10 and [0064], lines 4-7, where the OHR (octad halftone monitor) is formed in the mask).”

Regarding claim 8, Chen discloses “wherein the phase zones comprise at least two zones with one phase zone larger than the other phase zone ([fig. 5b, where 14 is larger than neighboring 12]).”

Regarding claim 9, Chen discloses “wherein the phase zones comprise at least two zones of substantially the same size (fig.3c, where 12s are identical in size).”

Regarding claim 10, Chen discloses “wherein the phase zones comprise a central phase zone and plurality of circumferential phase zones wherein the central phase zone is larger than the circumferential phase zones (fig. 5b, where 14 is larger than neighboring 12’s).”

Regarding claim 13, Chen discloses “wherein each phase zone is circular, rectangular, elliptical, or hexagonal ([0055], lines 2-5).”

Regarding claim 14, Chen discloses “wherein the target comprises a central phase zone and eight circumferential phase zones [0057], lines 9-10 and fig. 5b, where there are eight 12s) equally angularly spaced from each other for detecting astigmatism, coma, spherical aberration and three point aberration (see fig. 3c, where 12s are equally angularly spaced and [0058], lines 3-5).”

Regarding claim 15, Chen discloses “wherein the test target has at least two circumferential phase zones spaced 180 degrees apart from each other for detecting

positive or negative lens aberration (fig.3a, where 12a and 12b are elements across from one another and [0058], lines 3-5)."

Regarding claim 16, Chen discloses "wherein the test target has at least two more circumferential phase zones spaced 180 apart from each other and 90 degrees from the first two circumferential phase zones for detecting positive and negative lens aberration (fig.3a, 12a - 12d, where 12a-b and 12c-d are right angles to each pair and each pair constituent is 180 degrees from the other and [0058], lines 3-5)."

Regarding claim 17, Chen discloses "wherein the test target has at least four circumferential phase zones located at 0, 90, 180, 270 degrees and two more phase zones at 135 and 315 degrees or 45 and 225 degrees to detect 45 degree astigmatism (fig.3a, 12s and 12a - 12d, where the elements are arranged at increments of 45 degrees from 0 to 360 degrees and [0058], lines 3-5)."

Regarding claim 18 and 20, Chen discloses "wherein the test target has phase zones with similar or different shapes (fig. 3a, where each element of 12 has a quadrilateral shape)."

Regarding claim 19, Chen discloses "wherein the test target has phase zones with circular, rectangular, elliptical, pentagonal, triangular or hexagonal shapes ([0055], lines 2-5)."

Regarding claim 21, Chen discloses "wherein the test target has a central phase zone with one shape and circumferential phase zones with a different shape (fig. 5b, where 12 are and 14 are of different shapes)."

Claim Rejections - 35 USC § 103

6. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

7. Claim 3 is rejected under 35 U.S.C. 103(a) as being unpatentable over Chen in view of Omura (US 2003/0147061).

Regarding claim 3, Chen teaches all of the claimed limitations except the use of microelectric equipment.

However, having “wherein the optical system comprises microelectronic photolithographic equipment for exposing a semiconductor wafer to a photomask carrying a pattern for a microelectronic device” is known to the art as it is evident by the teaching of Omura ([0301], line 2, where the apparatus uses a fly-eye lens). Thus, it would have been obvious to one ordinary skilled in the art at the time the invention was made to modify Chen in a manner described above for at least the purpose to produce a more accurate image.

8. Claims 4 and 5 are rejected under 35 U.S.C. 103(a) as being unpatentable over Chen in view of Lee (US 2003/0203319).

Regarding claims 4 and 5, Chen teaches “where λ is the wavelength of the light exposing the target and NA is the numerical aperture of the exposure system ([0007], line 10),” but does not teach “wherein size of the phase zones and the spaces between the phase zones are between $0.5\lambda\text{NA}$ to $1.5\lambda\text{NA}$ ” nor “wherein the size of the target is between $2.0\lambda\text{NA}$ to $6.0\lambda\text{NA}$ where λ is the wavelength of the light exposing the target and NA is the numerical aperture of the exposure system.”

However, having (claim 4) “wherein size of the phase zones and the spaces between the phase zones are between $0.5\lambda\text{NA}$ to $1.5\lambda\text{NA}$ ” and (claim 5) “wherein the size of the target is between $2.0\lambda\text{NA}$ to $6.0\lambda\text{NA}$ where λ is the wavelength of the light exposing the target and NA is the numerical aperture of the exposure system” are known to the art as it is evident by the teaching of Lee ([0006], lines 5-6 and fig. 3a, where the spaces between patterns are allowed to be greater or less than the value of λ).” Thus, it would have been obvious to one ordinary skilled in the art at the time the invention was made to modify Chen in a manner described above for at least the purpose to detect various of other aberrations.

9. Claims 11 and 12 are rejected under 35 U.S.C. 103(a) as being unpatentable over Chen in view of Fukuhara et al (6,839,132).

Regarding claim 11, Chen teaches all of the claimed limitations except a central phase zone being substantially the same size as a circumferential phase zone.”

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However, having “wherein the central phase zone is substantially the same size as the circumferential phase zones” is known to the art as it is evident by the teaching of Fukuhara et al (fig. 15, #150, where the two central vertical patterns are substantially the same size). Thus, it would have been obvious to one ordinary skilled in the art at the time the invention was made to modify Chen in a manner described above for at least the purpose to detect more aberrations.

Regarding claim 12, Chen teaches all of the claimed limitations except for a central phase zone being smaller than a circumferential phase zone.

However, having “wherein the central phase zone is smaller than the circumferential phase zones” is known to the art as it is evident by the teaching of Fukuhara et al (fig. 15, 150, where the are various sizes of vertical patters presented).” Thus, it would have been obvious to one ordinary skilled in the art at the time the invention was made to modify Chen in a manner described above for at least the purpose to detect more aberrations.

10. Claim 22 is rejected under 35 U.S.C. 103(a) as being unpatentable over Chen in view of Wristers et al (6,552,776).

Regarding claim 22, Chen teaches

- “arranging a test object in the object plane of the system,
- providing a photoresist layer in the image plane of the system ([0003], lines 1-2),

- imaging the test object by means of the system and an imaging beam ([0003], lines 2-4);
 - developing the photoresist layer ([0003], lines 7-8), and
 - detecting the developed image by means of a scanning detection device ([0063], lines 14-15),
- characterized in that use is made of a test object which comprises at least one open figure having a phase structure, wherein the image of this figure is compared to a reference image of known or no aberration in order to determine the type and amount of aberration in the optical imaging system ([0019], lines 10-13, where predetermined patterns are printed on a substrate and then compared to the predetermined patterns of the mask)."

Chen does not teach a "scanning detection device having a resolution which is considerably larger than that of the imaging system."

However, having "scanning detection device having a resolution which is considerably larger than that of the imaging system" is known to the art as it is evident by the teaching of Wristers et al (col. 7, 1-3, where the SEM uses a high resolution)." Thus, it would have been obvious to one ordinary skilled in the art at the time the invention was made to modify Chen in a manner described above for at least the purpose to perform more accurate measurements.

Conclusion

11. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the date of this final action.

12. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Kevin Gutierrez whose telephone number is (571)-272-5922. The examiner can normally be reached on Monday-Friday: 7:30 a.m. - 4:30 p.m..

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Judy Nguyen can be reached on (571)-272-2258. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



Kevin Gutierrez
Examiner
Art Unit 2851

March 14, 2006